United States Patent [19]

Cheng

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[54] **CLAMPING SYSTEM**

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[51] **Int. Cl.**[5] **E05C 3/16**

[52] **U.S. Cl.** **292/111;** 24/606; 292/113

[58] **Field of Search** 24/606–608, 24/598, 599, 633; 292/113, 111, 247

[56] **References Cited**

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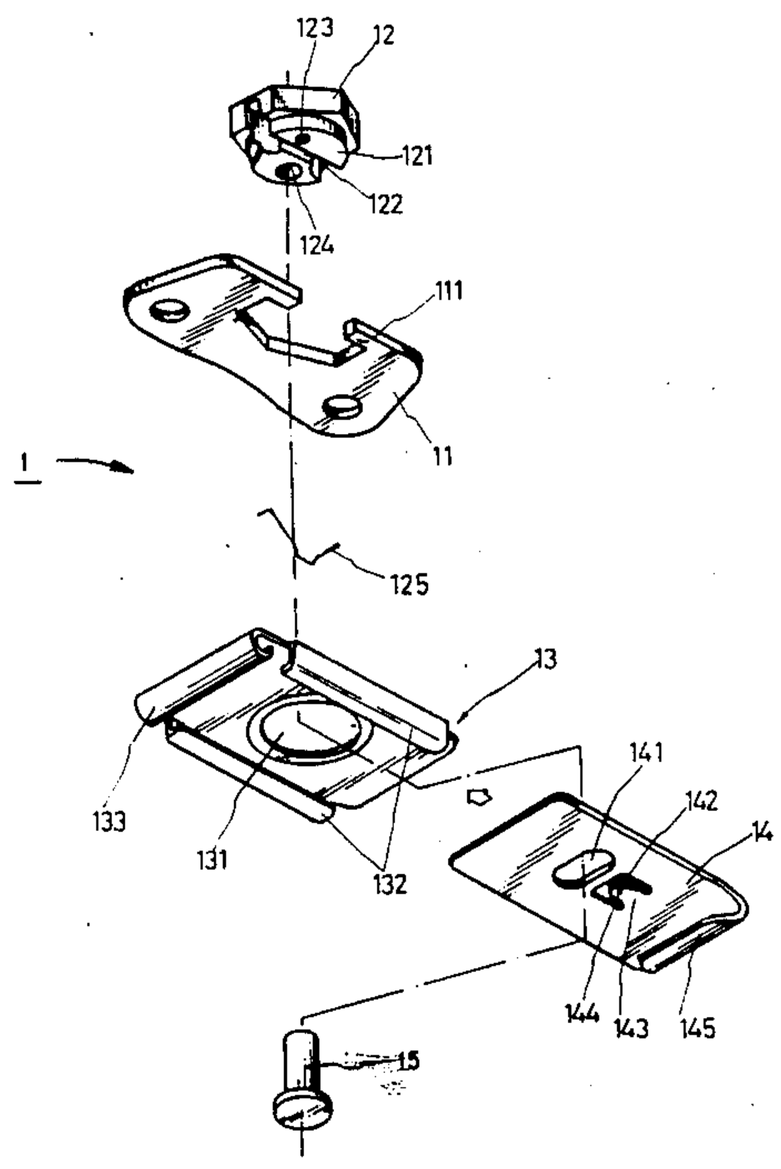
Attorney, Agent, or Firm—Morton J. Rosenberg; David I. Klein

[57] **ABSTRACT**

There is disclsed an improved clamping system for releaseably securing two external members (**30**) and (**40**) each to the other. The improved clamping system includes a hook member (**3**) which is fixedly secured to external member (**40**) and a chassis mechanism (**2**) which is fixedly secured to external member (**30**). The chassis mechanism (**2**) includes a U-shaped supporting frame (**21**) having a spring (**22**) passing therethrough. A clamping mechanism (**1**) is provided which includes a rotative displacement member (**12**) having an eccentric groove hole (**124**) formed in a lower disk member (**121**). A bridge plate member (**13**) having a central opening (**131**) encloses and provides a linear restraint for a sliding plate member (**14**) which includes a slot (**141**) passing therethrough. An insertion pin (**15**) passes through the slot (**141**), the central opening (**131**) and is insertable within the groove hole (**124**). Rotation of the rotative displacement member (**12**) provides for a responsive linear reversible displacement of the sliding plate member (**14**) for allowing a hooked end (**145**) to grasp onto the curved end of the hook member (**3**). In this manner, there is provided an economical, easily manufacturable, one-piece improved clamping system.

4 Claims, 8 Drawing Sheets



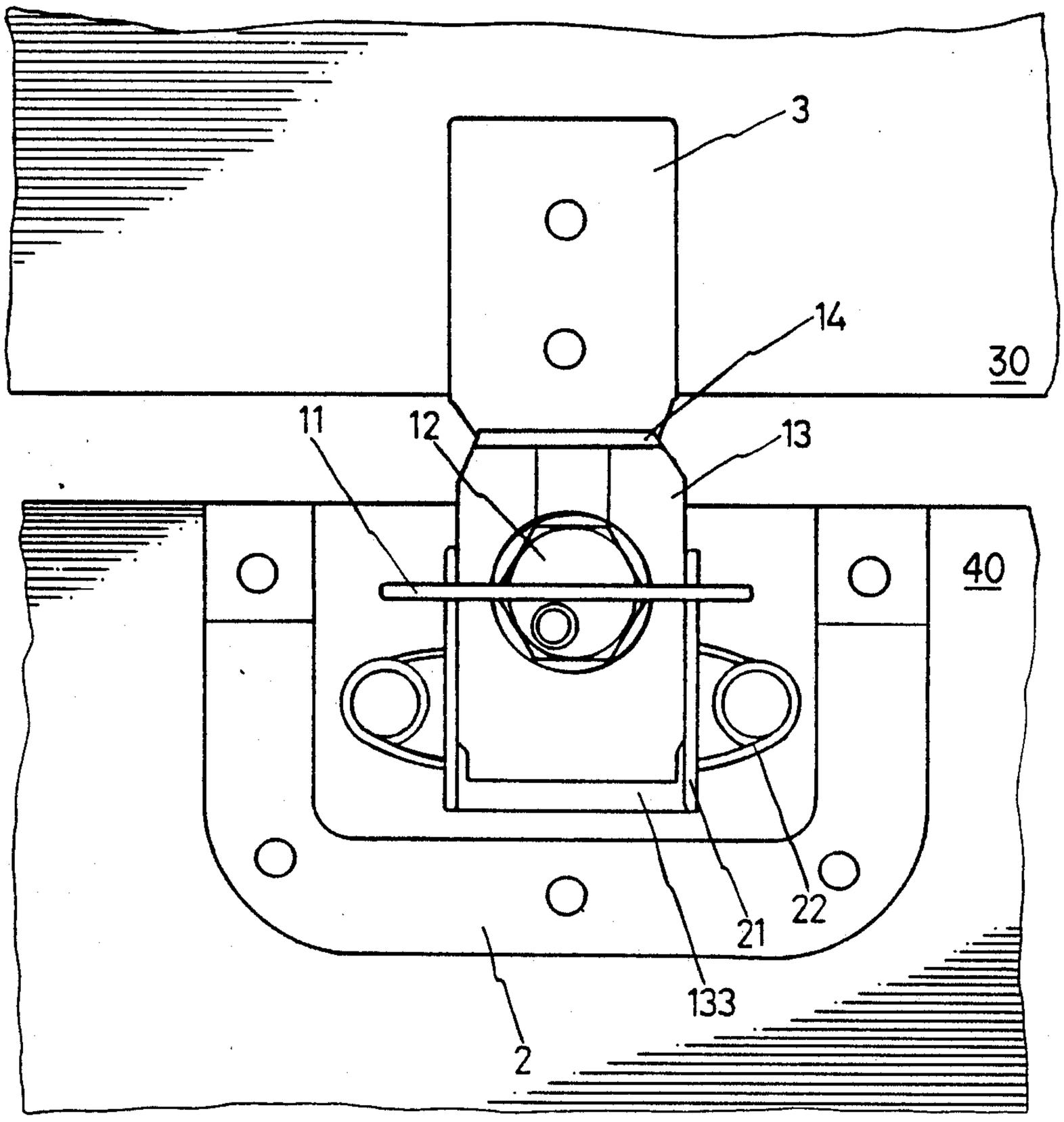


FIG. 1

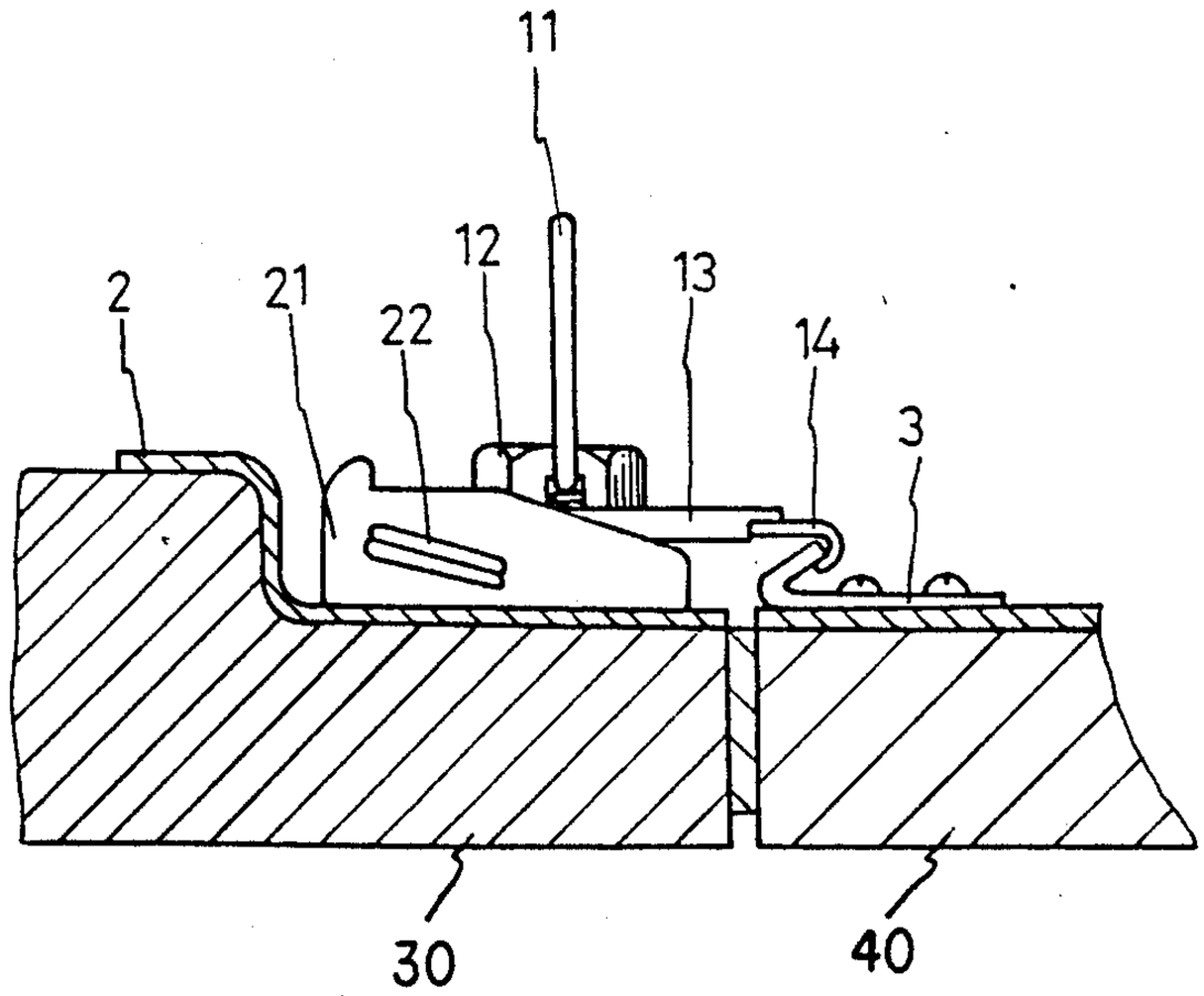


FIG. 2

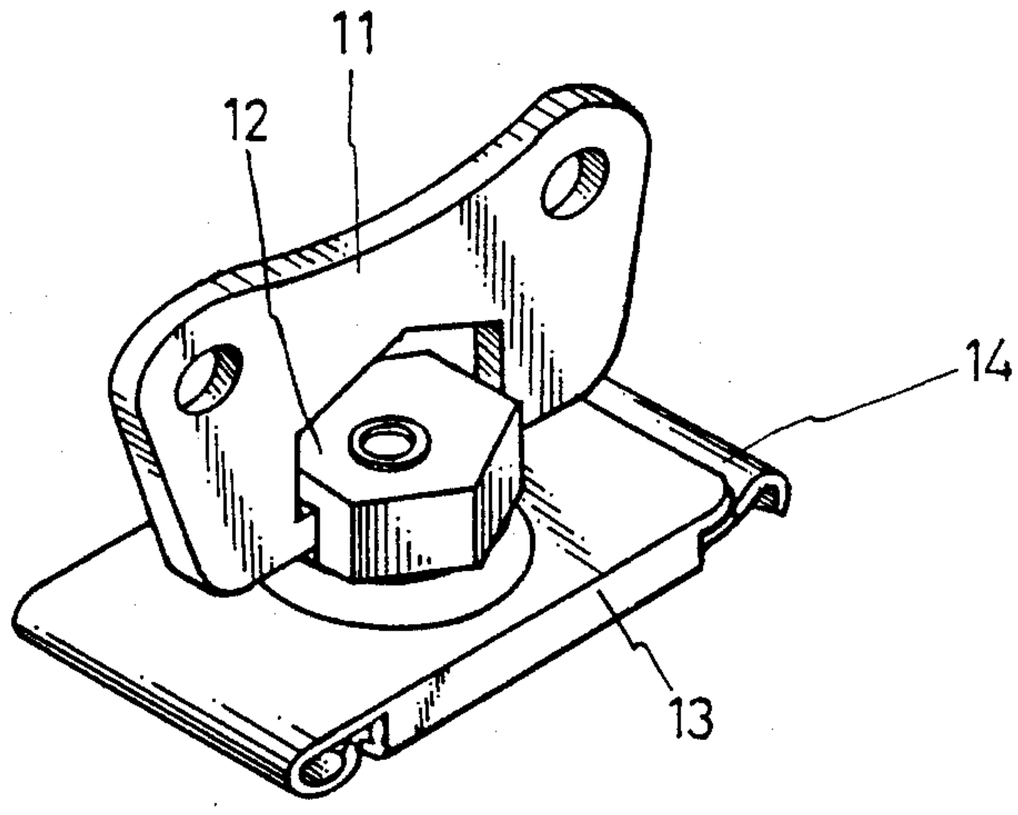


FIG. 3

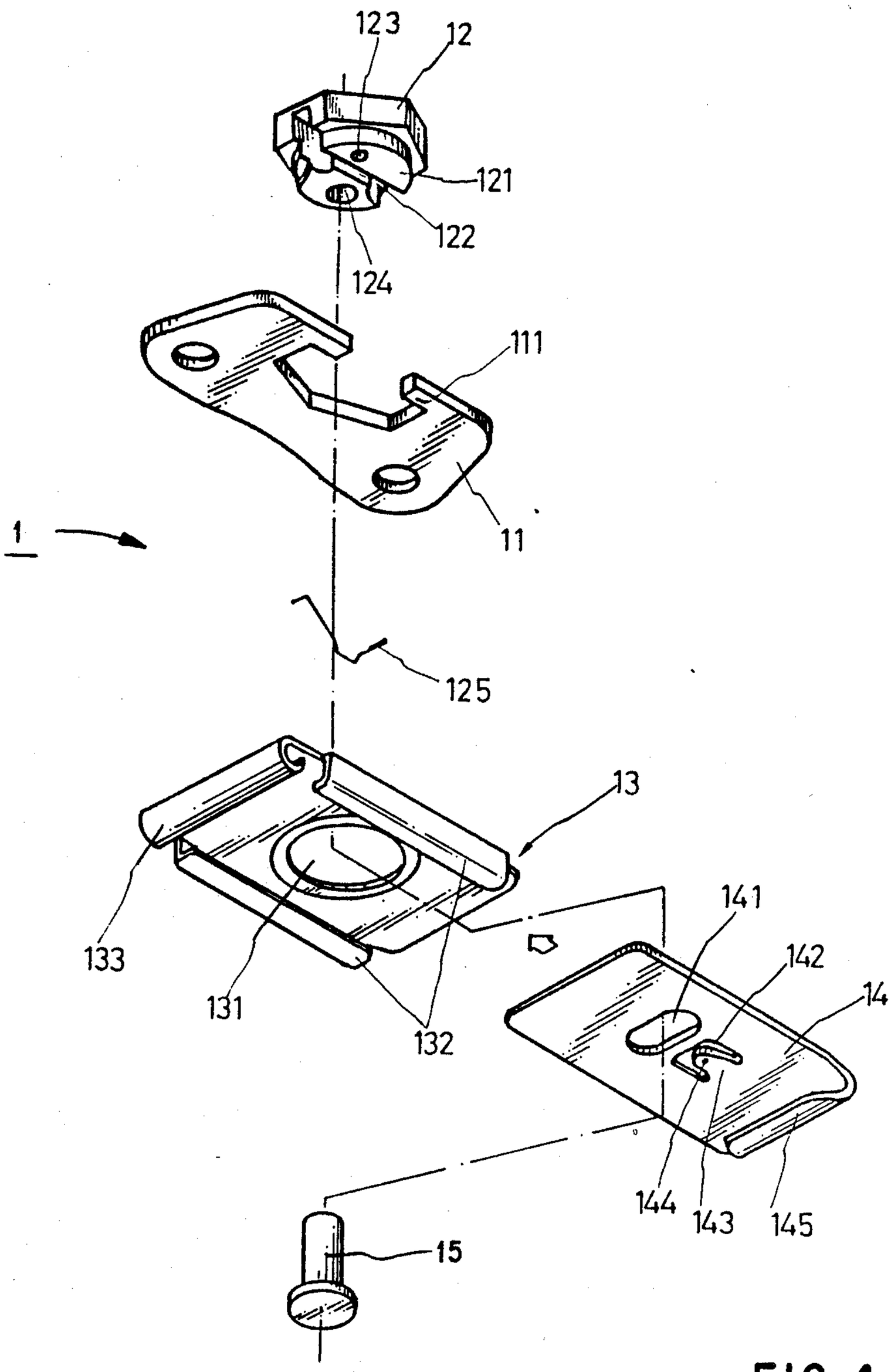

123
12
121
122
124
111
1
11
125
13
133
131
132
141
142
14
144
143
145
15

FIG. 4

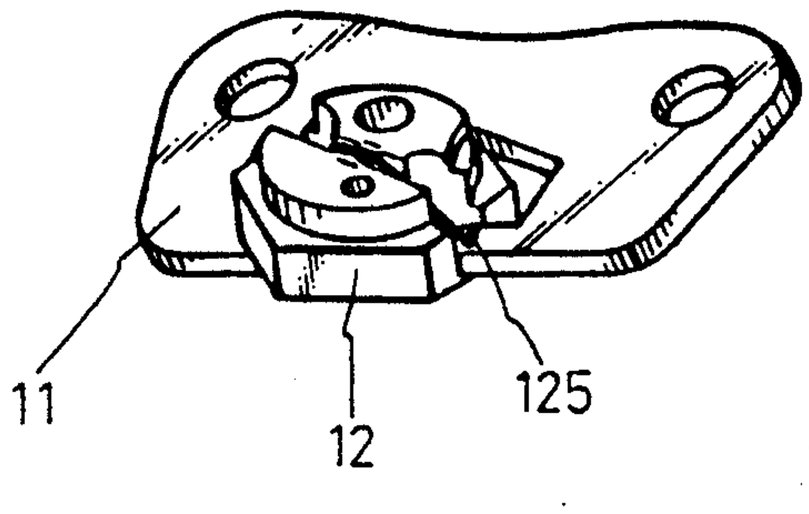


FIG. 5

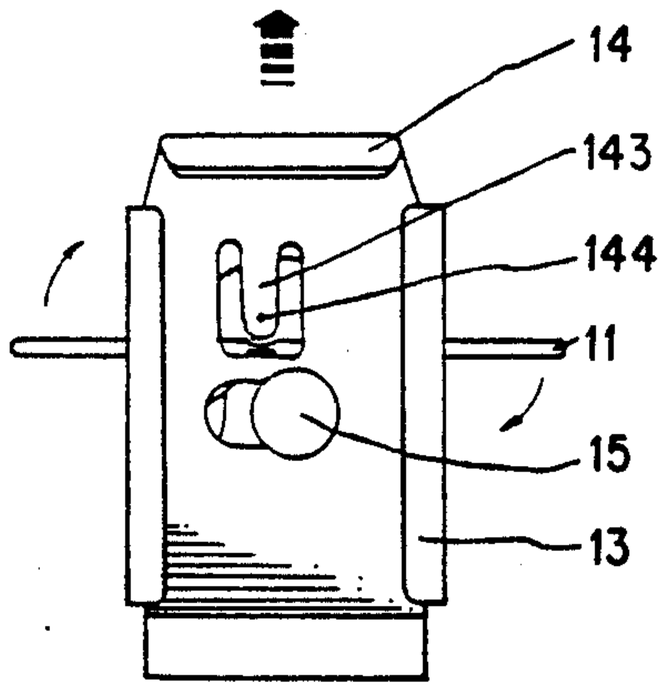


FIG. 6A

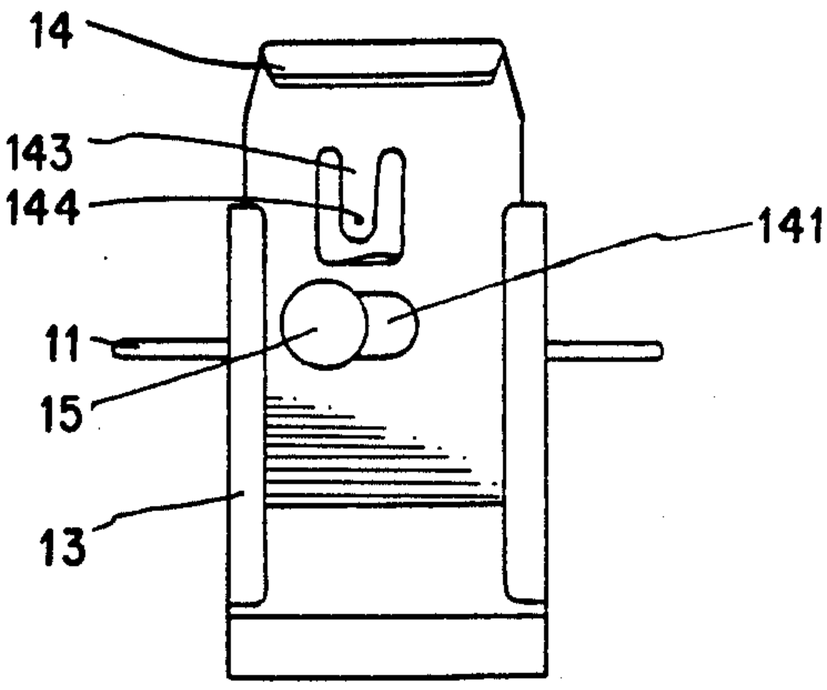


FIG. 6B

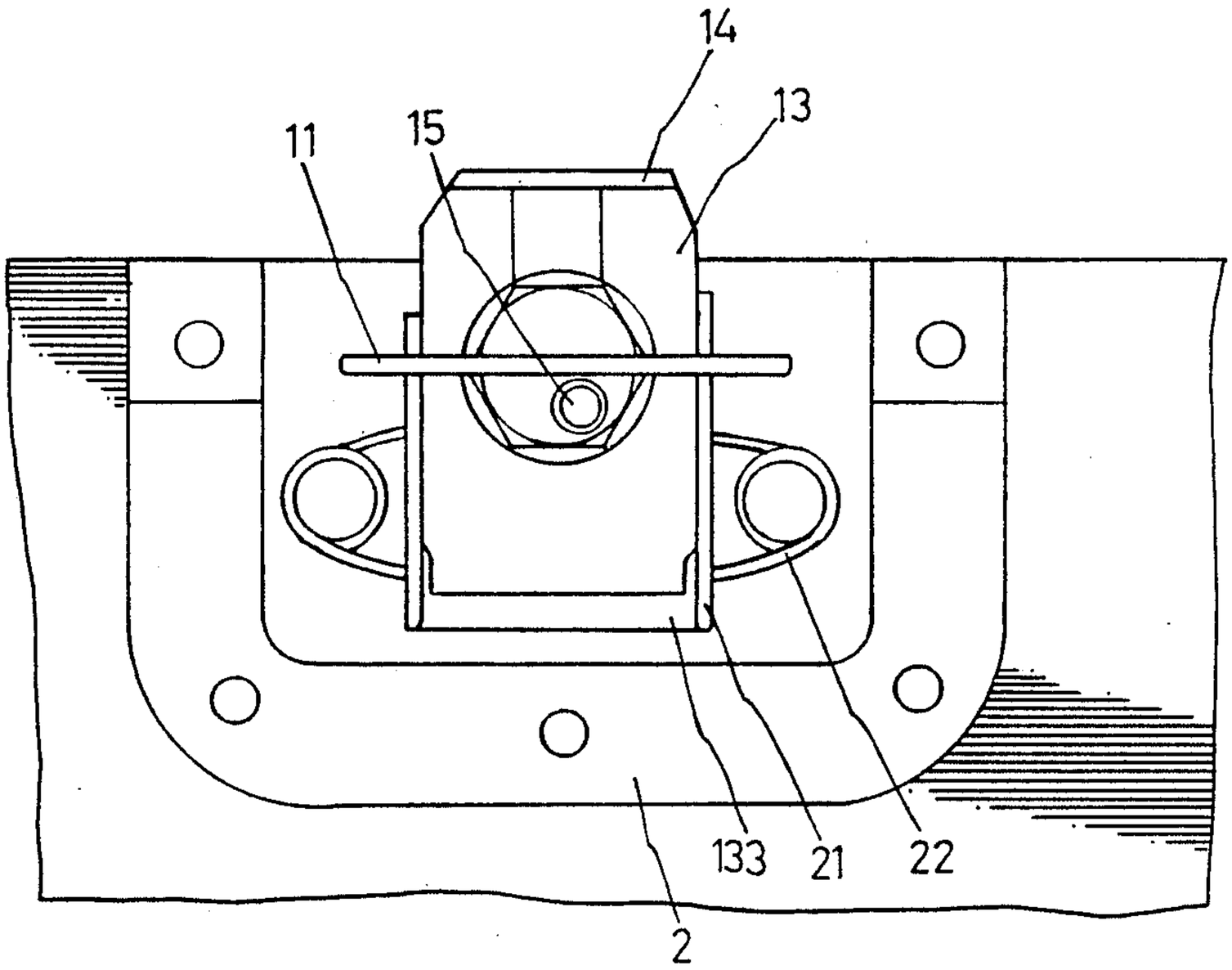


FIG. 7A

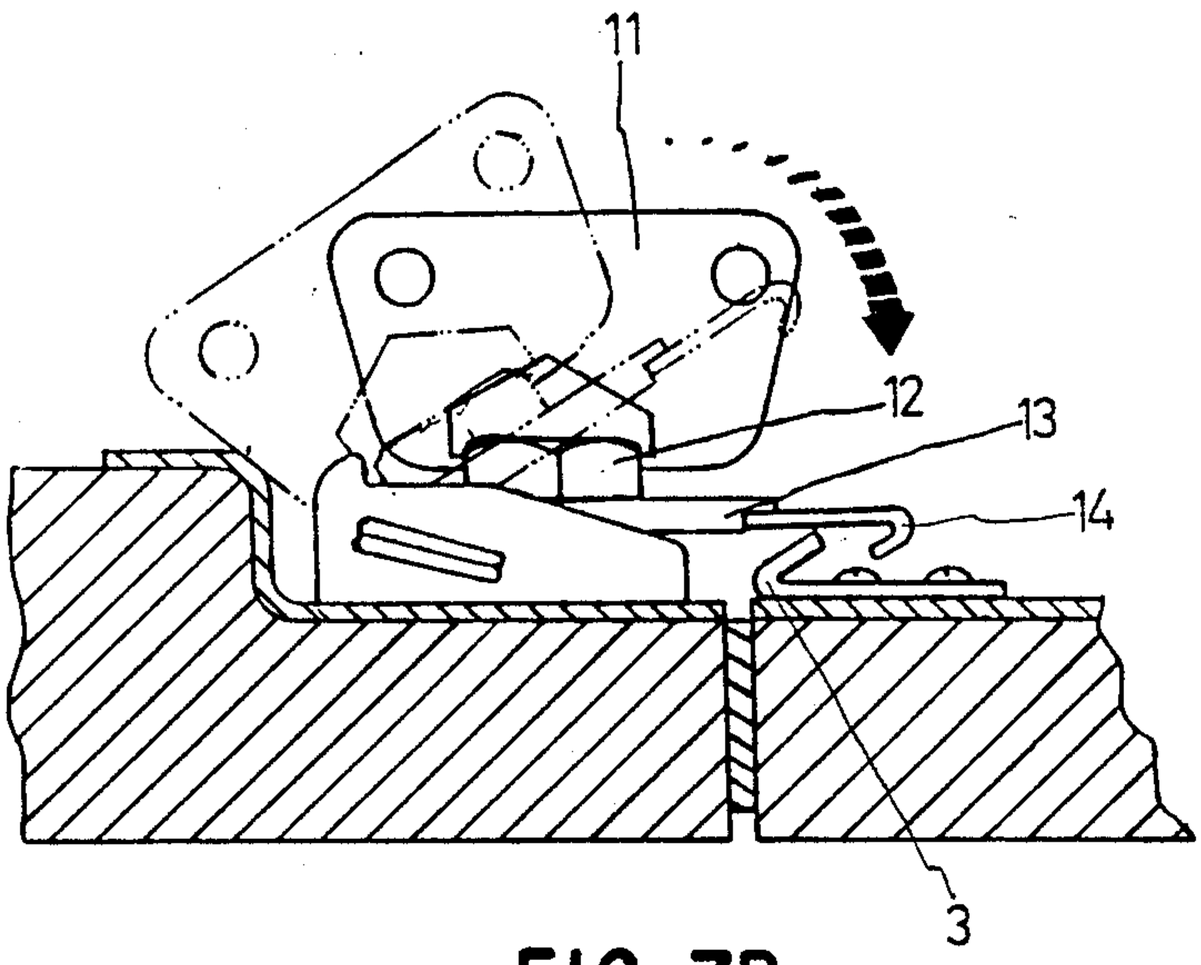


FIG. 7B

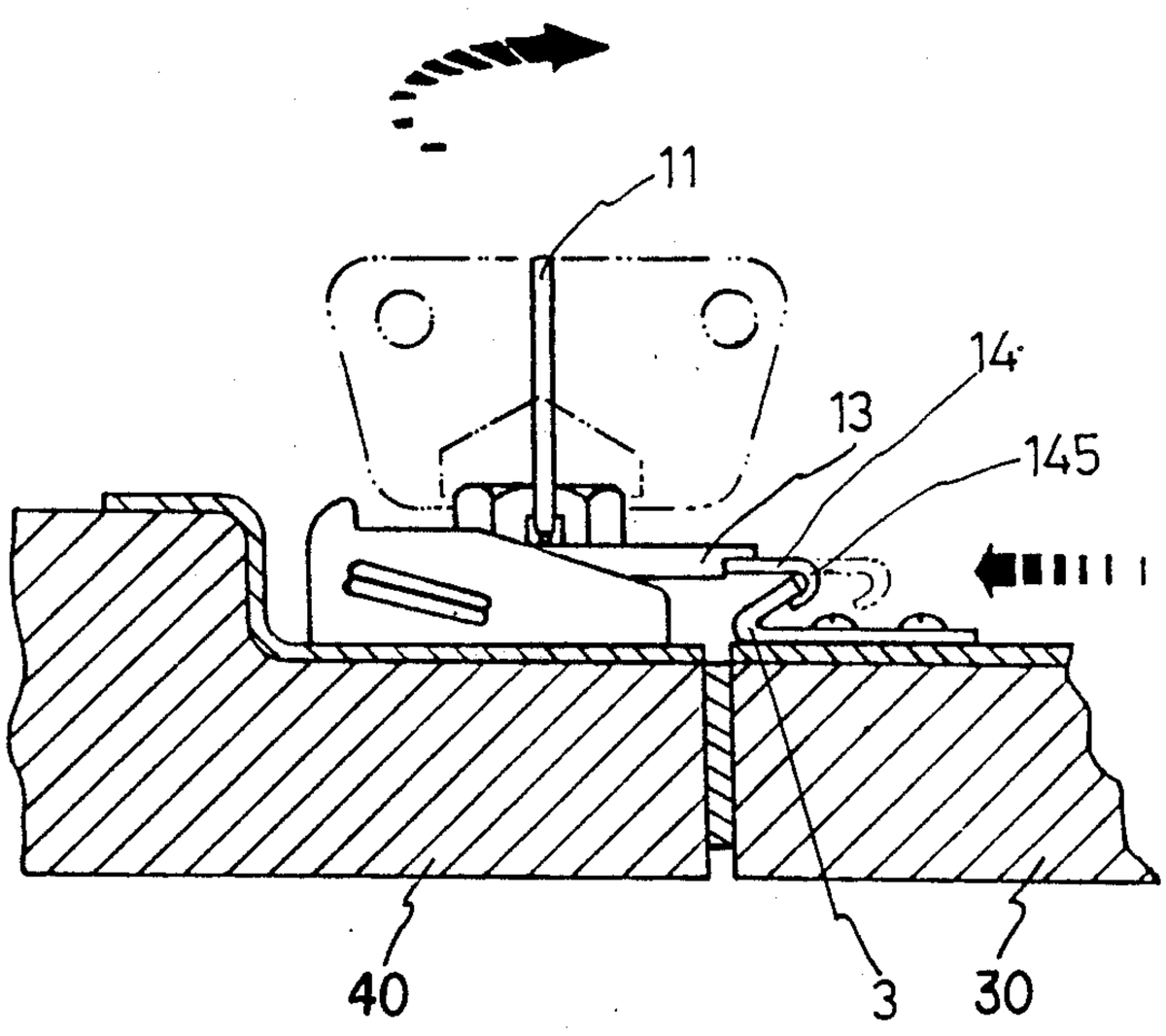


FIG. 7C

CLAMPING SYSTEM

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention pertains to clamping structures for releaseably clamping opposing external members. In particular, this invention directs itself to an improved clamping system having a hook member secured to one of the external members to be clamped and a chassis mechanism secured to the other of the external members. A clamping mechanism is provided which is attached to the chassis mechanism and by rotative displacement provides for a linear displacement of a sliding plate member for hooking and capturing the hook member fixedly mounted on the other external member. More in particular, this invention relates to a rotative displacement member which includes an eccentric groove hold within which an insertion pin is provided. Further, this invention directs itself to an improved clamping system where rotative displacement of a disk member responsively linearly actuates a sliding plate member for capturing a hook member on one of the external members to be clamped.

PRIOR ART

Many prior art releaseable clamping systems include a number of parts and elements which make a very complex structure. Such prior art clamping systems include production time costs which are extensive and are complicated to assemble, resulting in a very high cost clamping system. Additionally, in prior art clamping systems the complexity of the combination elements provided for a low reliability of operation and did not provide for economic advantages in use.

SUMMARY OF THE INVENTION

An improved clamping system for releaseably securing two external members each to the other. The improved clamping system includes a hook member which is fixedly secured to one of the external members. A chassis mechanism is fixedly secured to the other of the external members. The chassis member includes a U-shaped supporting frame and a spring member extending through the supporting frame. Of importance, there is provided a clamping mechanism for clamping each of the external members to the other. The clamping mechanism includes a rotative displacement member having a disk shaped lower portion member. The disk member has a horizontal groove formed therein for insertion of opposing ear members of a butterfly shaped operating plate member. An elongated spring member is positionally located within the horizontal groove for providing a biasing force on the opposing ear members for positioning the butterfly operating plate member. The disk member is divided by the groove into a first section having a concavely shaped recess and a second section having a groove opening. The groove opening is located eccentric to a rotational axis of the rotative displacement member. The clamping mechanism further includes a bridge plate member having a central opening and a curved bottom wall for passing over one arm of the chassis spring member. The bridge plate member is in sliding engagement with a sliding plate member having a curved end portion for engaging the hook member and further includes a slot formed through the sliding plate member. The slot as well as the central opening and the groove opening are vertically aligned

for insert therethrough of an insertion pin member. The sliding plate member further includes a U-shaped opening defining a spring tongue having a raised portion for removable insert into the concavely shaped recess in the disk member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of the improved clamping system showing opposing external members to be clamped;

FIG. **2** is an elevation view of the improved clamping system shown mounted in a clamped condition on opposing external members;

FIG. **3** is a perspective view of the clamping mechanism of the improved clamping system of the subject invention concept;

FIG. **4** is a perspective exploded view of the clamping mechanism of the subject invention;

FIG. **5** is a perspective view of the upper portion of the clamping mechanism;

FIG. **6***a* and **6***b* bottom are views of the clamping mechanism showing two opposing conditions of the sliding plate member; and, FIG. **7***A–C* show operational elevational views of the improved clamping system between an unclamped and a clamped condition.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. **1–7**, there is shown an improved clamping system for releaseably coupling external panel members **30**, **40** each to the other. External panel members **30** and **40** provide for a substantially planar extension at their upper surfaces as is clearly seen in FIG. **2**. Hook member **3** is fixedly secured to external member **40** at an upper surface through threaded securement such as screws, bolt or some like technique not important to the inventive concept as herein described. Hook member **3** includes a hook end section which is releaseably coupled to other elements of the improved clamping system as will be detailed in following paragraphs.

Referring now to FIGS. **2**, 7A, 7B and 7C, there is provided a chassis mechanism **2** which is fixedly secured to external member **30**. Chassis mechanism **2** includes a U-shaped supporting frame and a flexible spring **22** extending therethrough. Flexible spring **22** generally has coiled opposing ends and two connecting arms, one coupled to the supporting frame **21** and the other coupled to the curved front wall **133** of bridge plate member **13**. The chassis mechanism **2** further includes a butterfly operating plate **11** having two connecting operating plate ears **111** which are insertable on opposing ends of horizontal groove **122** formed in disk **121**.

Elongated flexible spring **125** is mounted adjacent operating plate ears **111** on a lower surface thereof to provide a biasing force to maintain butterfly operating plate **11** in a substantially biased positional relation with respect to chassis mechanism **12**. Basically, spring **125** is compressively mounted on ears **111** as is shown in FIG. **5**.

First section **121** includes concavely shaped recess **123** and disk second section includes groove hole **124** which is positioned eccentric to a vertical center line rotation axis of rotative displacement member **12**.

Bridge plate member **13** is generally planar in contour and includes central opening **131** passing therethrough as is shown in FIG. **4**. Additionally, bridge plate mem-

ber **13** includes concavely directed lower walls **132** and frontal curved wall **133**. Frontal curved wall **133** is hook shaped and is adapted for passing over and being held by one of the extending legs which bias other elements in the improved clamping system as will be detailed in following paragraphs.

Referring now to FIGS. **3–5**, there is shown clamping mechanism **1** for releaseably clamping each of external members **30, 40** to the other. Clamping mechanism **1** includes rotative displacement member **12** which is rotatable about a vertical axis line. Rotative displacement member **12** generally includes an upper polygonal shaped disk and a lower disk **121** which generally is circular in contour as is seen in FIG. **4** and has a diameter less than an external perimeter diameter of the upper portion of rotative displacement member **12**.

Disk **121** includes horizontal groove **122** formed in a diameter line therethrough. In this manner, disk **121** is divided into a first and second section having cross-sections in the contour of a semi-circle. Horizontal groove **122** passes through disk **121** and is adapted for insertion of a butterfly arms **111** insertable into groove **122**. The supporting frame **21** and the bridge plate member **13**, coupled to respective shaped operating plate **11**. Butterfly operating plate **11** includes butterfly arms of spring member **22**, are mounted on cassis mechanism **2**. Thus, linear displacement of bridge plate member **13** causes a pulling on one of the arms of spring **22** and provides a biasing retarding displacement force. As has been described, spring **22** is mounted to chassis **2** and the associated U-frame supporting member **21** as is shown in FIG. **2**.

Sliding plate member **14** is generally planar in contour and includes horizontal slot **141** formed therethrough. Insertion pin member **15** passes through slot **141**, central opening **131**, and then into groove hole **124** of rotative displacement member **12**.

Sliding plate member **14** is insertable between concave walls **132** of bridge plate member **13** and is slidable in a reversible linear direction as can be seen in FIGS. **4** and **7**. Sliding plate member **14** includes frontal hook member **145** which is adapted to interface and be captured by the frontal curved section of hook member **3** as is shown in FIG. **2**.

Sliding plate member **14** further includes U-shaped groove **142** passing therethrough as is shown in FIG. **4**. Extending through the center is spring tongue **143** having a raised portion member **144** which is adapted for insert into concavely contoured recess **123** of rotative displacement member **12**.

Referring now to FIGS. 7A, 7B and 7C, there is shown the operation of the improved clamping system. Since curved end **133** passes around in loose fashion one of the arms of flexible spring **22**, the mechanism **1** may be rotated to the phantom line drawing configuration shown in FIG. 7B. In this configuration, sliding plate member **14** and the associated hook member **145** are not in contact with the hook portion of hook member **3**. As shown in FIG. 7C, butterfly operating plate **11** is rotated which causes insertion pin **15** to be linearly displaced due to the fact that insertion pin **15** passes through slot **141** and causes a linear displacement of sliding plate member **14**. In this manner, angled end **145** hooks into the curved end of hook member **3** to provide a releaseable coupling between the external members **30** and **40**.

Other operational aspects are shown in FIG. **6**. In a non-clamped condition, sliding plate member **14** is displaced internal to bridge plate member **13** between concave walls **132**. Raised or convex portion **144** of spring tongue **143** snaps into concave recess **123** on rotative displacement member **12**.

When butterfly operating plate member **111** is rotated about a vertical axis, raised portion **144** on spring tongue **143** exits from a concave recess **123** on rotative displacement member **12**. Eccentric groove hole **124** moves or displaces insertion pin **15** on sliding plate member **14**. The eccentric displacement is provided as operating plate **11** revolves about **180°** with a responsive degree change for rotative displacement member **12**.

In this manner, a simple rotative displacement results in a linear reversible displacement of related elements in the improved clamping system as herein detailed.

What is claim is:

1. An improved clamping system for releaseably securing two external members each to the other, comprising:

(a) a hook member fixedly secured to one of said external members;

(b) chassis means fixedly secured to the other of said external members, said chasis means including a U-shaped supporting frame and a spring member extending through said supporting frame;

(c) means for clamping each of said external members to the other, said clamping means including a rotative displacement member having a disk shaped lower portion member, said disk member having a downwardly open horizontal groove formed therein for insertion of opposing ear members of a butterfly shaped operating plate member, an elongated spring member is positionally located substantially entirely within said horizontal groove and being compressively mounted on said opposing ear members for providing a biasing foce on said opposing ear members for positioning said butterfly operating plate member, said disk member being divided by said groove into a first section having a concavely shaped recess and a second section having an opening formed therethrough, said opening formed in said second section being located eccentric to a rotational axis of said rotative displacement member, said clamping means further including a bridge plate member having a central opening and a curved bottom wall for passing over one arm of said chassis spring member, said bridge plate member being in sliding engagement with a sliding plate member having a curved end portion for engaging said hook member and a slot formed through said sliding plate member, said slot, central opening, and opening formed in said second section of said disk member being vertically aligned for insert therethrough of an insertion pin member, said sliding plate member further including a U-shaped opening defining a spring tongue having a raised portion for removable insert into said concavely shaped recess in said disk member.

2. The improved clamping system as recited in claim **1** where rotation of said rotative displacement member provides a responsive linear displacement of said sliding plate member.

3. The improved clamping system as recited in claim **2** where said clamping means is rotatively displaceable in a plane substantially normal to a plane defining said hook member and chassis means mounting surfaces.

4. The improved clamping system as recited in claim **1** where said clamping means is formed as an integral structure.

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